Sampling and Interpreting Biotic Scores for Intermittent Streams in the San Diego Region

Chad Loflen, Raphael Mazor, Andy Rehn

STATE OF CALIFORNIA
SAN DIEGO REGION
REGIONAL WATER QUALITY CONTROL BOARD

CALIFORNIA DEPARTMENT OF FISH & WILDLIFE

California Department of
Fish and Wildlife

Aquatic Bioassessment Laboratory

SCCWRP
Established 1969

SWAMP
Surface Water Ambient Monitoring Program

California State University
SAN MARCOS

MPSL
Marine Pollution Studies Laboratory

Outline

- Background and Study Design
- Results to Date
- Highlight 3 Sites

Importance of Intermittent Streams

- Ubiquitous: In San Diego Region > 70% of Streams
- Aquatic and Terrestrial Organisms
- Fluvial Processes
- Groundwater Recharge
- Nutrient Cycling

Perennial Semi-permanent Intermittent Ephemeral Arid

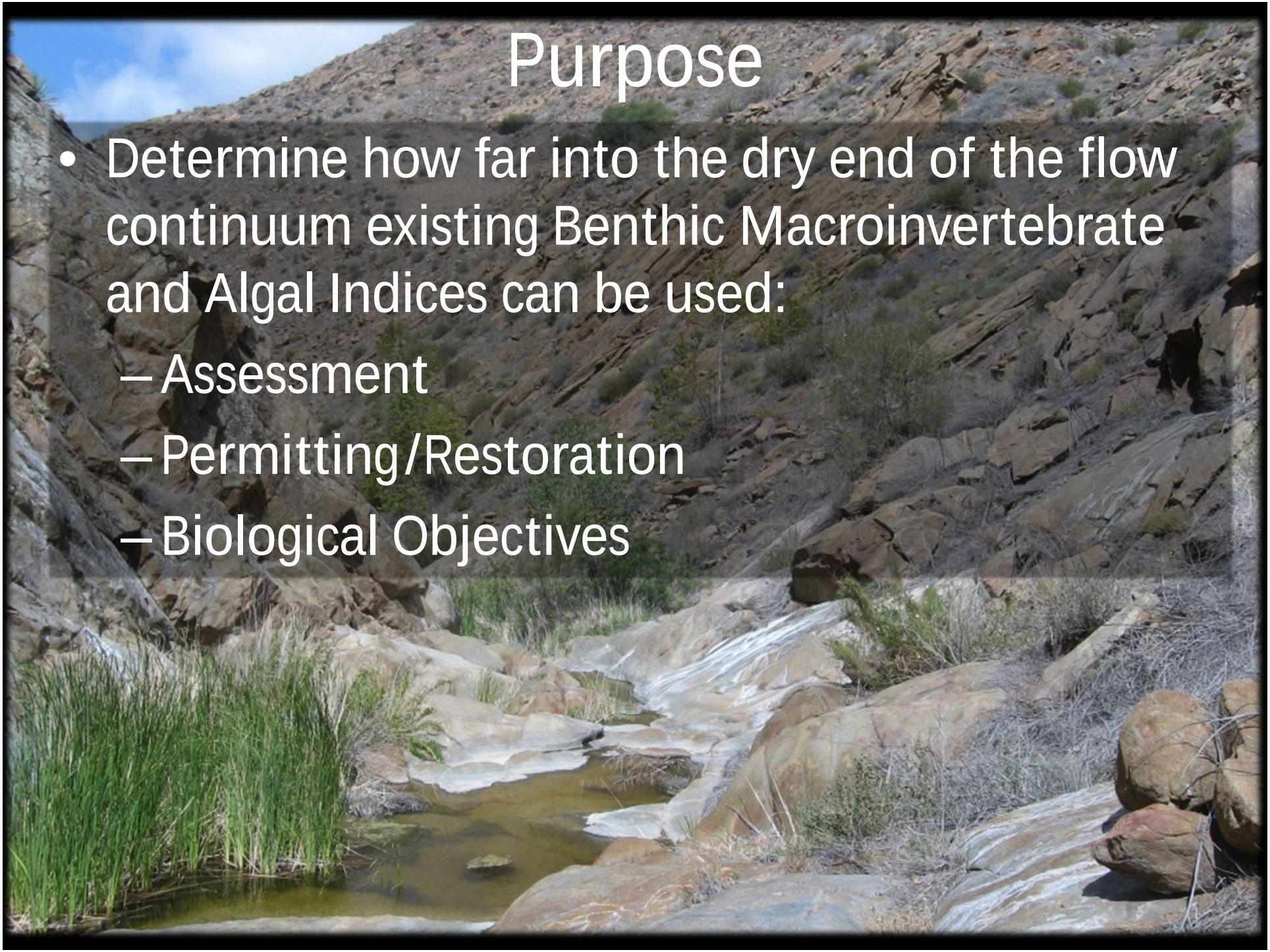
Wetter Drier

$$$$$$$$$$$$.....$$

The Stream Flow Continuum

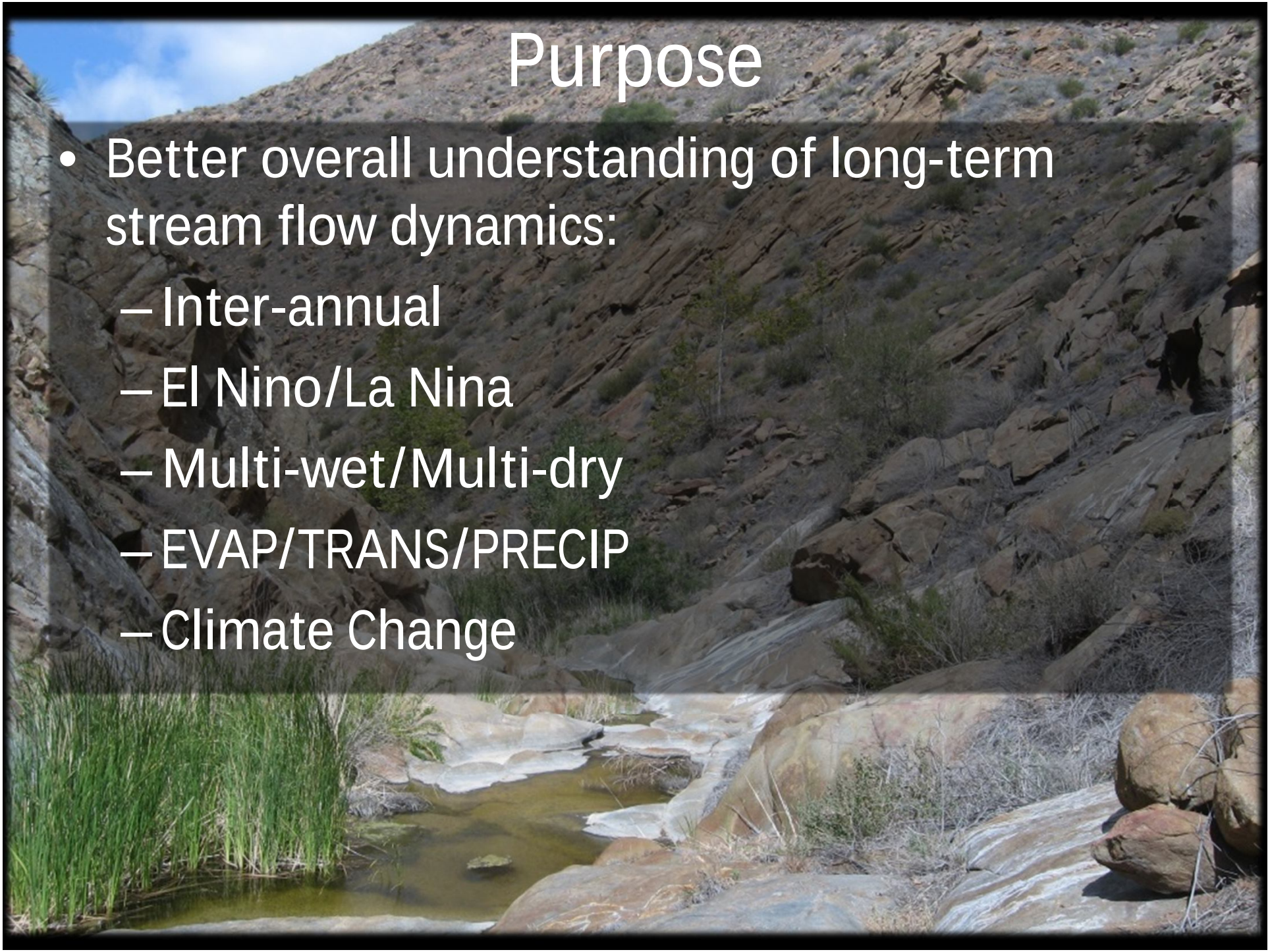
Purpose

- Determine how far into the dry end of the flow continuum existing Benthic Macroinvertebrate and Algal Indices can be used:
  - Assessment
  - Permitting/Restoration
  - Biological Objectives



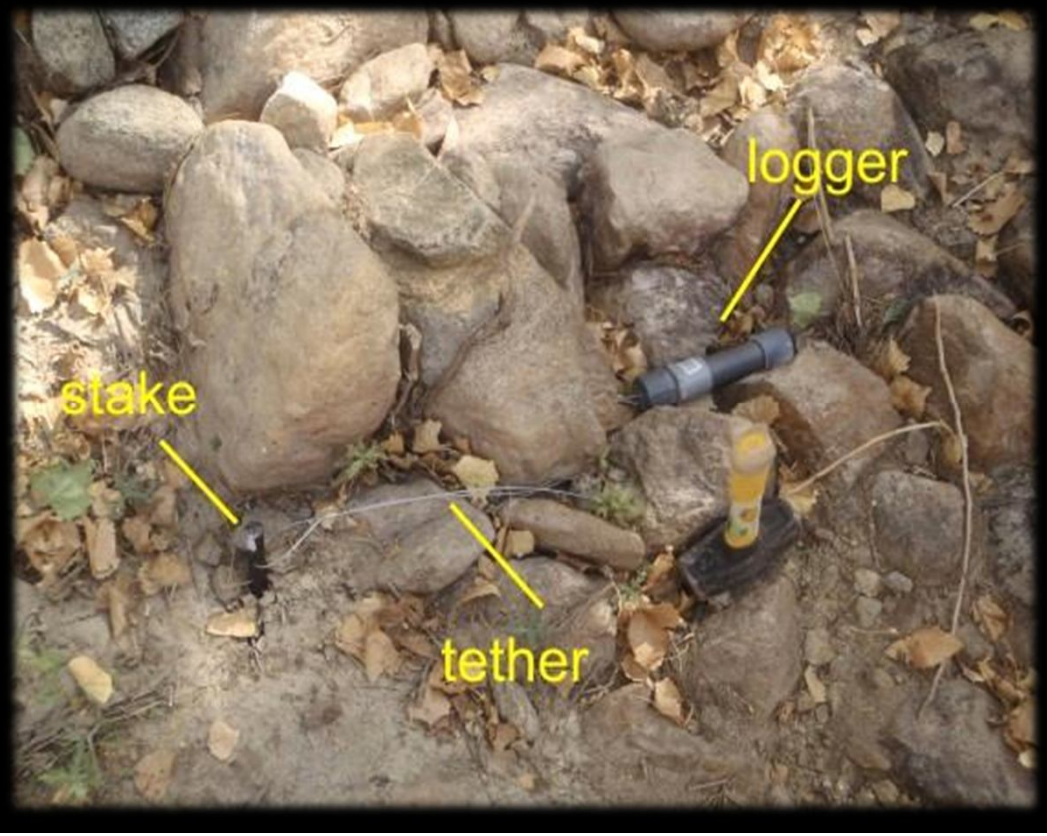
Purpose

- Better overall understanding of long-term stream flow dynamics:
  - Inter-annual
  - El Nino/La Nina
  - Multi-wet/Multi-dry
  - EVAP/TRANS/PRECIP
  - Climate Change



Reference Site Approach

- SWAMP Reference Used to Evaluate Indices
- Deploy HOBO U20 Water Level Loggers
  - Flow Permanence and Variability
- Visit Sites in Spring
- SWAMP SOP

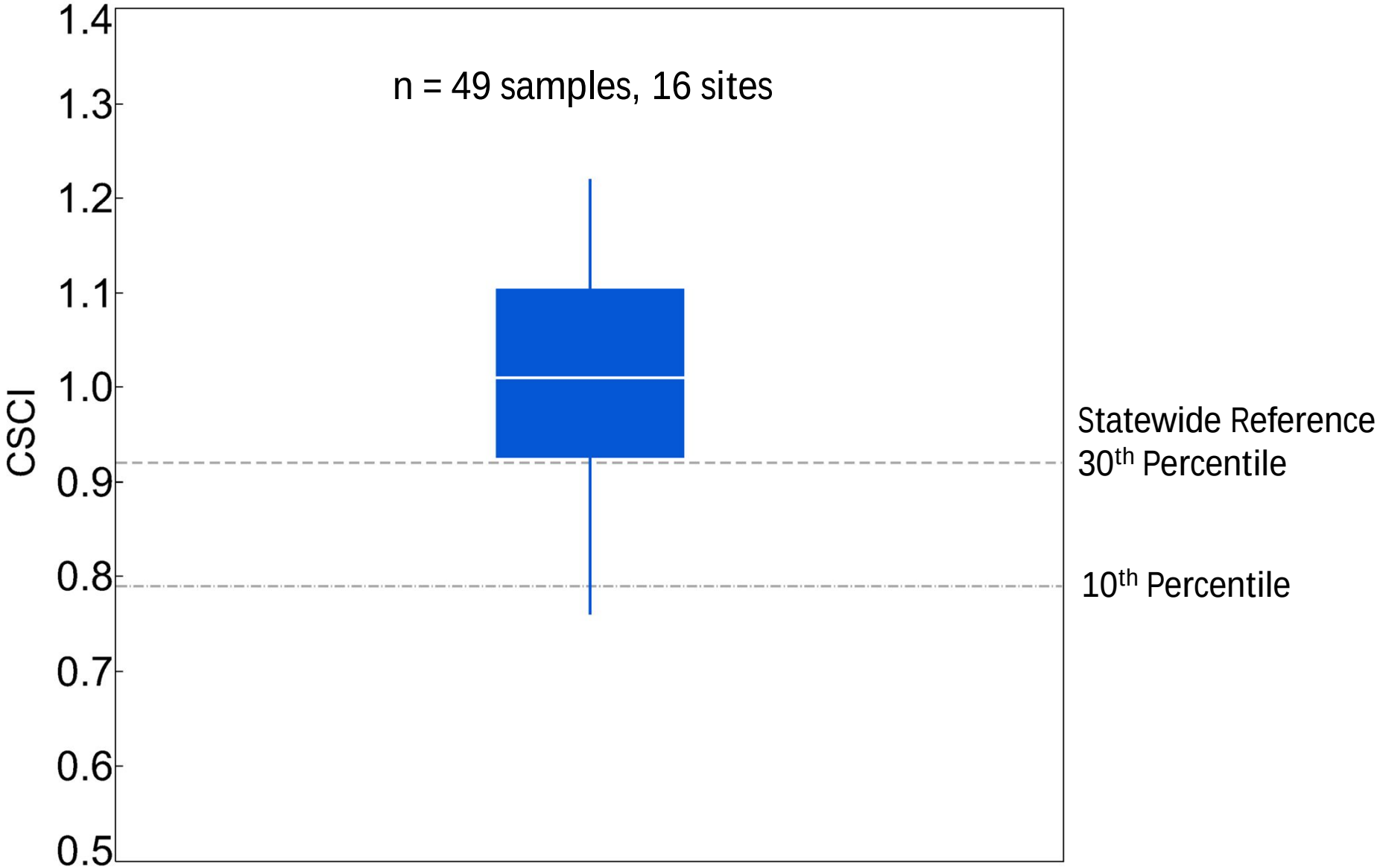


Reference Site Approach

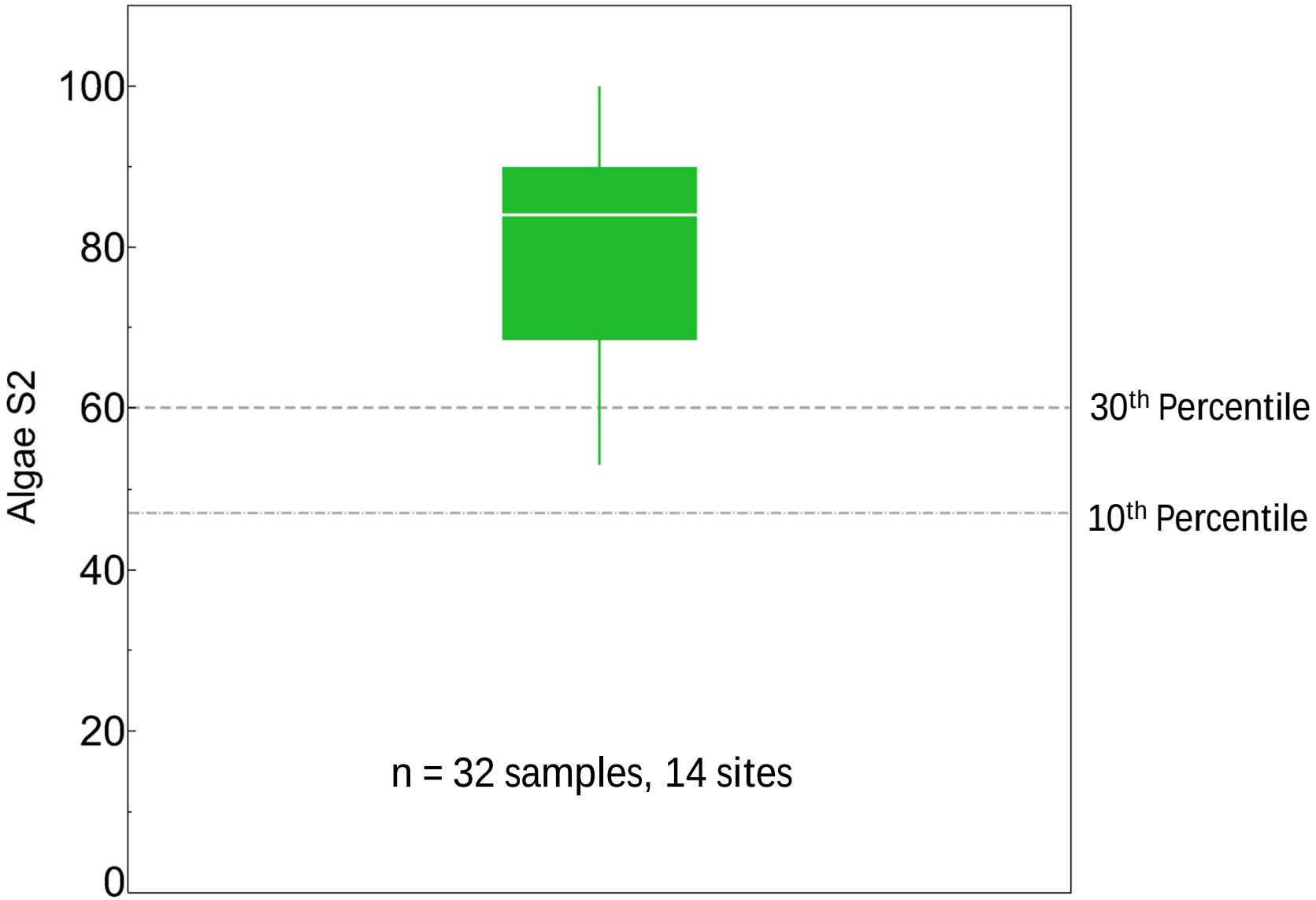
- 2010: SCCWRP Study 12 Sites, 4 Reference
- Spring 2013: Pilot Loggers at 4 Sites
- Fall 2013: Loggers Deployed at 22 Sites
- Fall 2014: Loggers Deployed at 38 Sites
- Fall 2015: Loggers Deployed at 43 Sites


N
20 mi

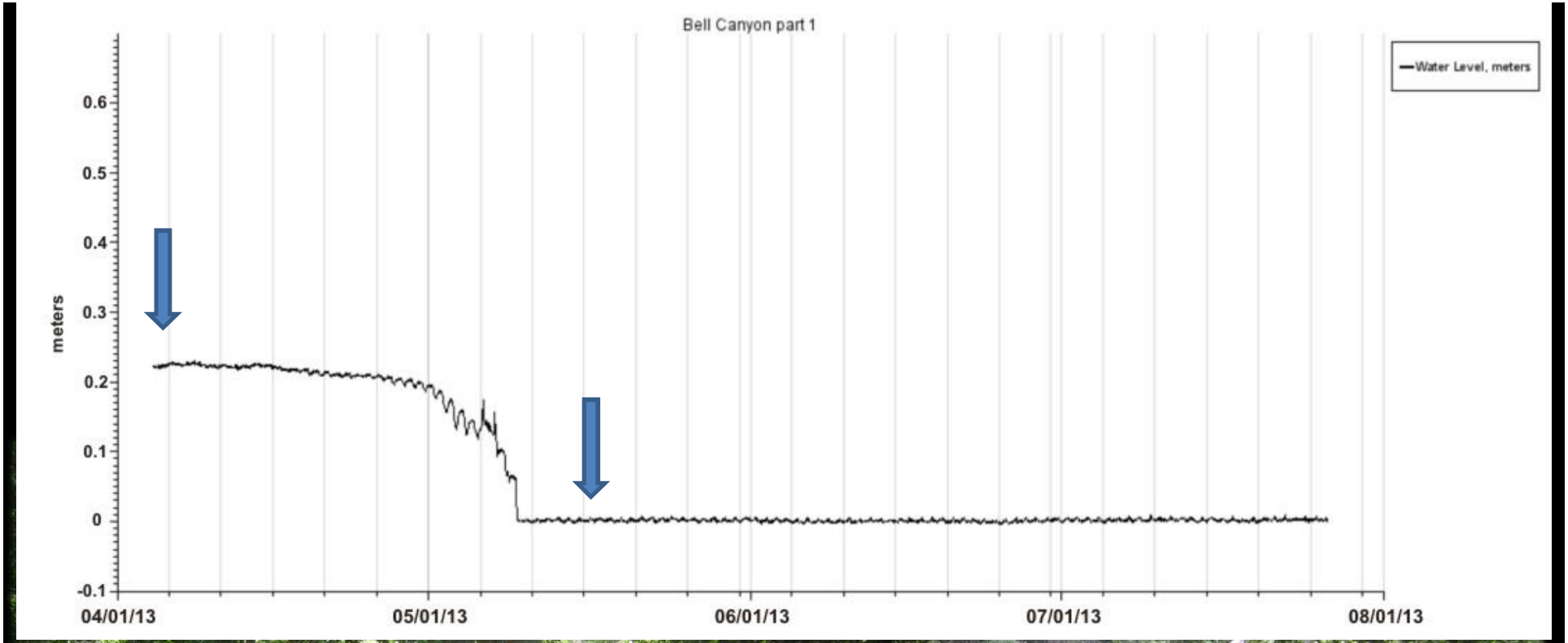
Results


n = 49 samples, 16 sites
CSCI
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
Statewide Reference
30th Percentile
10th Percentile

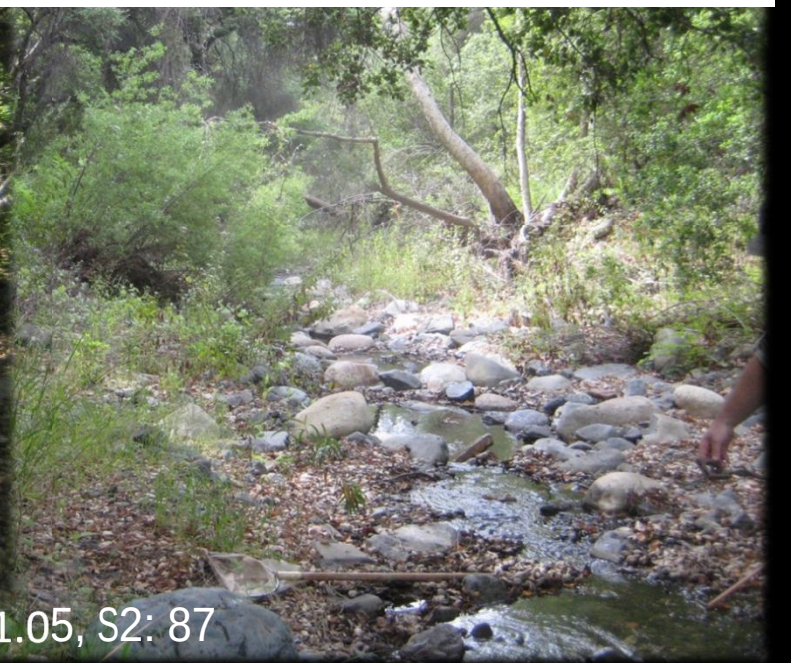
Results

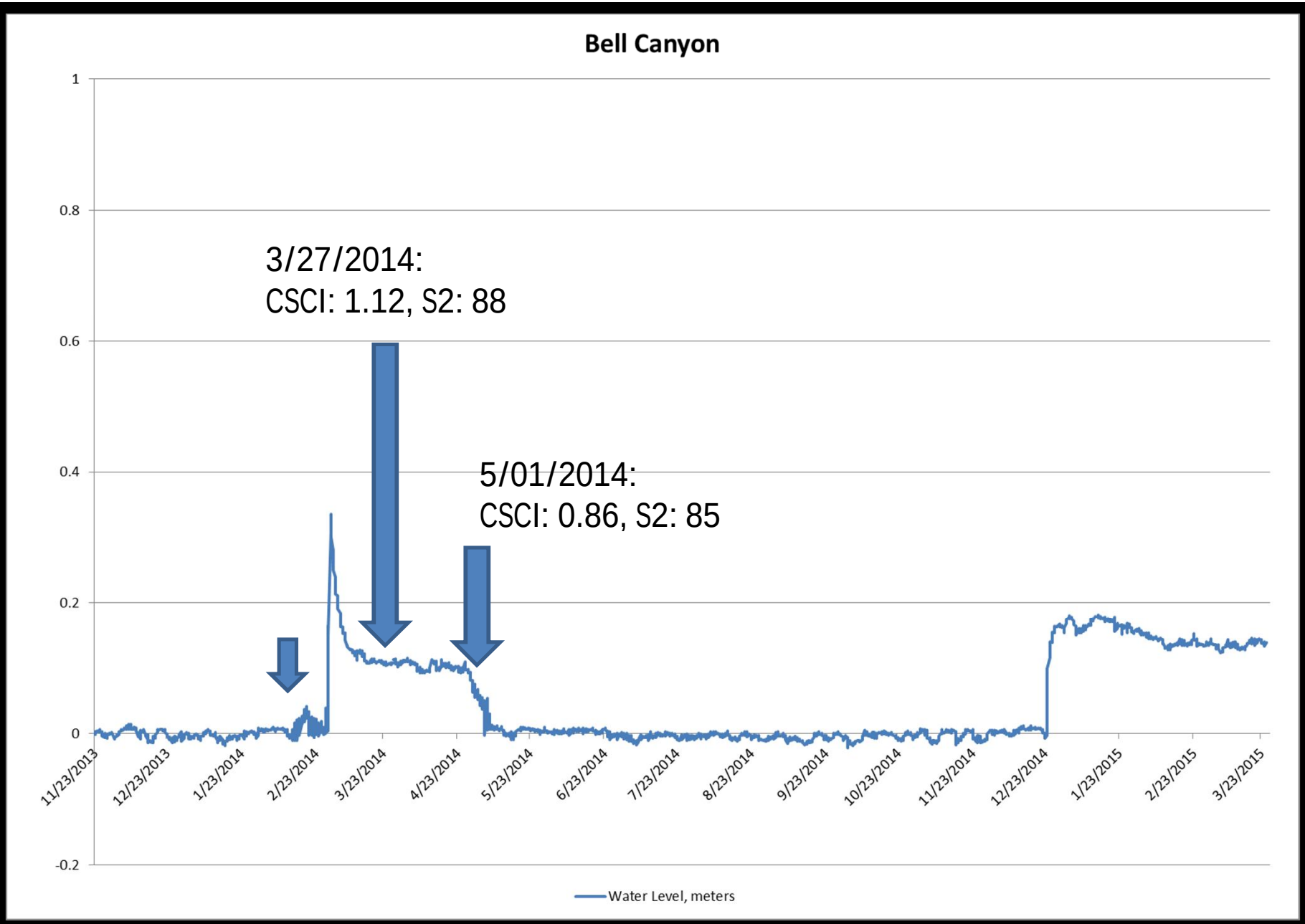

Algae S2
100
80
60
40
20
0
30th Percentile
10th Percentile
n = 32 samples, 14 sites


Bell Canyon
Indian Flats
Carney Canyon
Irvine
Palm Springs
Rancho Mirage
Indio
Temecula
Oceanside
Escondido
San Diego
Tijuana
Tecate
Delegacion La Presa
Google earth
40 mi
N


Bell Canyon part 1
Water Level, meters
meters
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
04/01/13
05/01/13
06/01/13
07/01/13
08/01/13


5/14/2013: CSCI: DRY

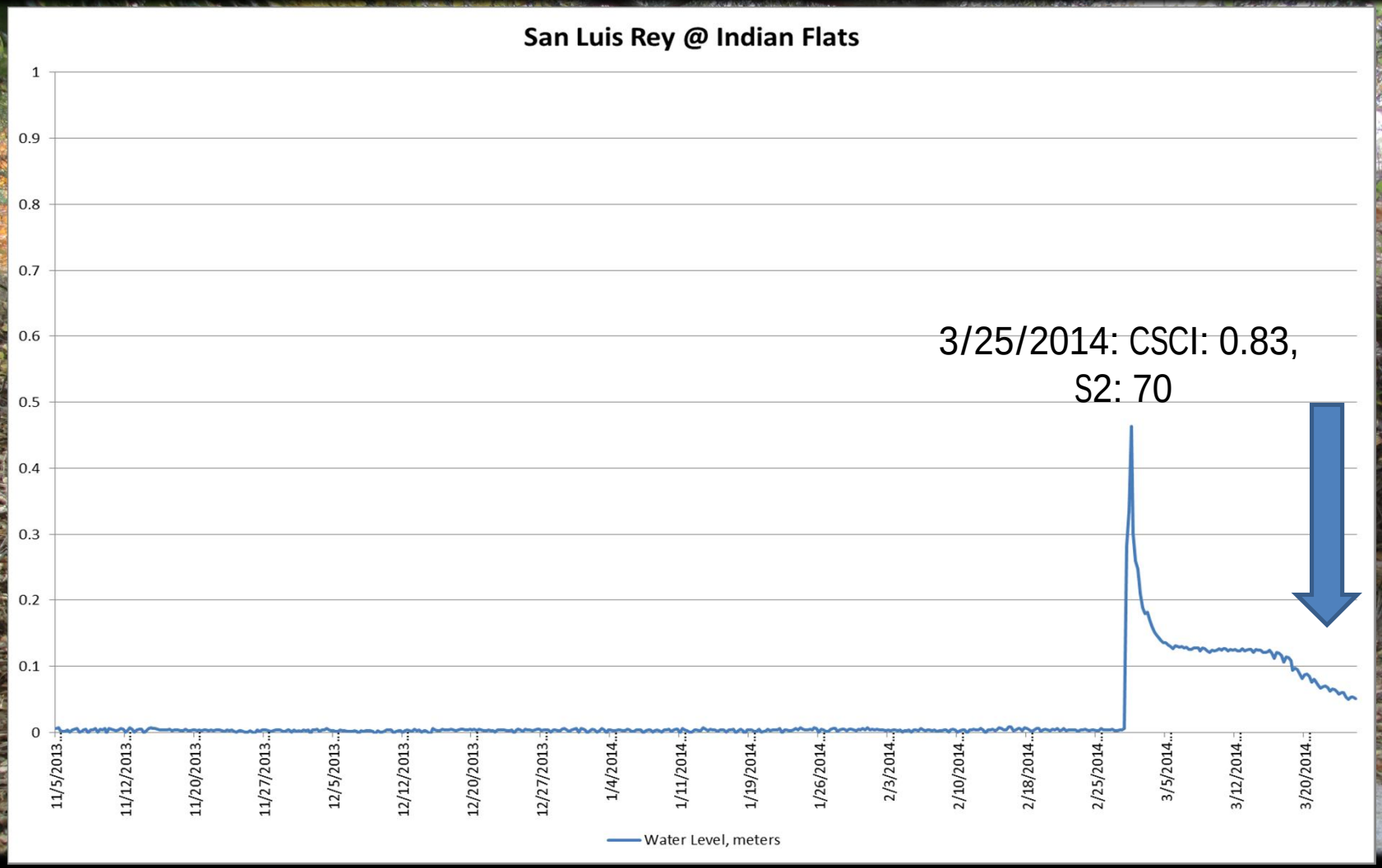

4/4/2013, CSCI: 1.05, S2: 87



Roughly 6 Weeks of "Flow" Prior to Sampling
Sampled 1 month Later at "Drying Stage"


Bell Canyon
Indian Flats
Carney Canyon
Irvine
Palm Springs
Rancho Mirage
Indio
Temecula
Oceanside
Escondido
San Diego
Tijuana
Tecate
Delegacion La Presa
Google earth
40 mi
N

Indian Flats



Field Crew: Barely Able to Sample, SOP Requirements Met

25 Days of Flow


Bell Canyon
Indian Flats
Carney Canyon
Irvine
Palm Springs
Rancho Mirage
Indio
Temecula
Oceanside
Escondido
San Diego
Tijuana
Tecate
Delegacion La Presa
Google earth
40 mi
N

Carney Canyon

5/12/2010 CSCI: 1.17

6/02/2010 CSCI: 1.12

6/16/2010 CSCI: 1.08

6/29/2010 CSCI: 1.1

Carney Canyon

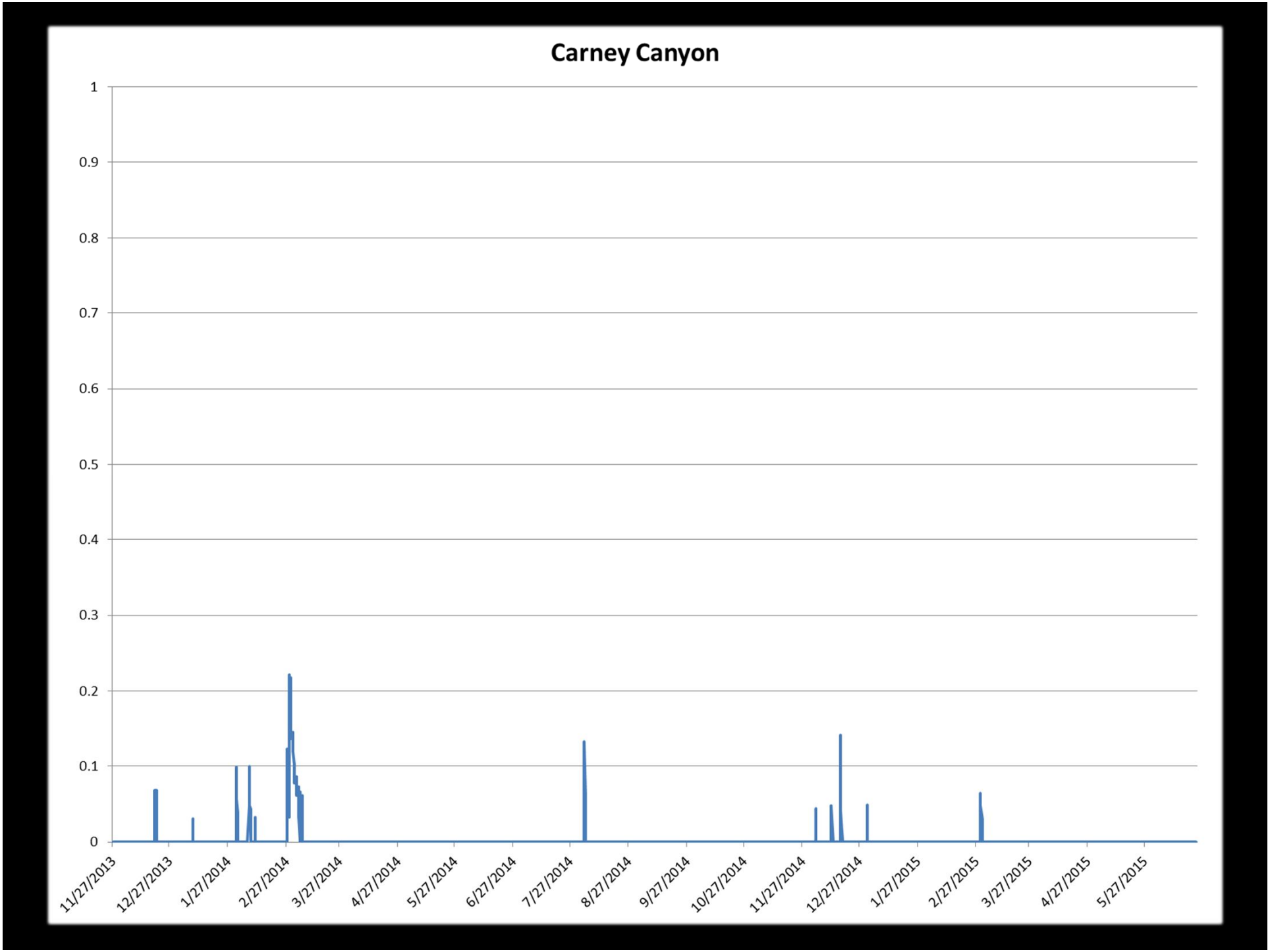
4/03/2013 CSCI: 1.1, S2: 75

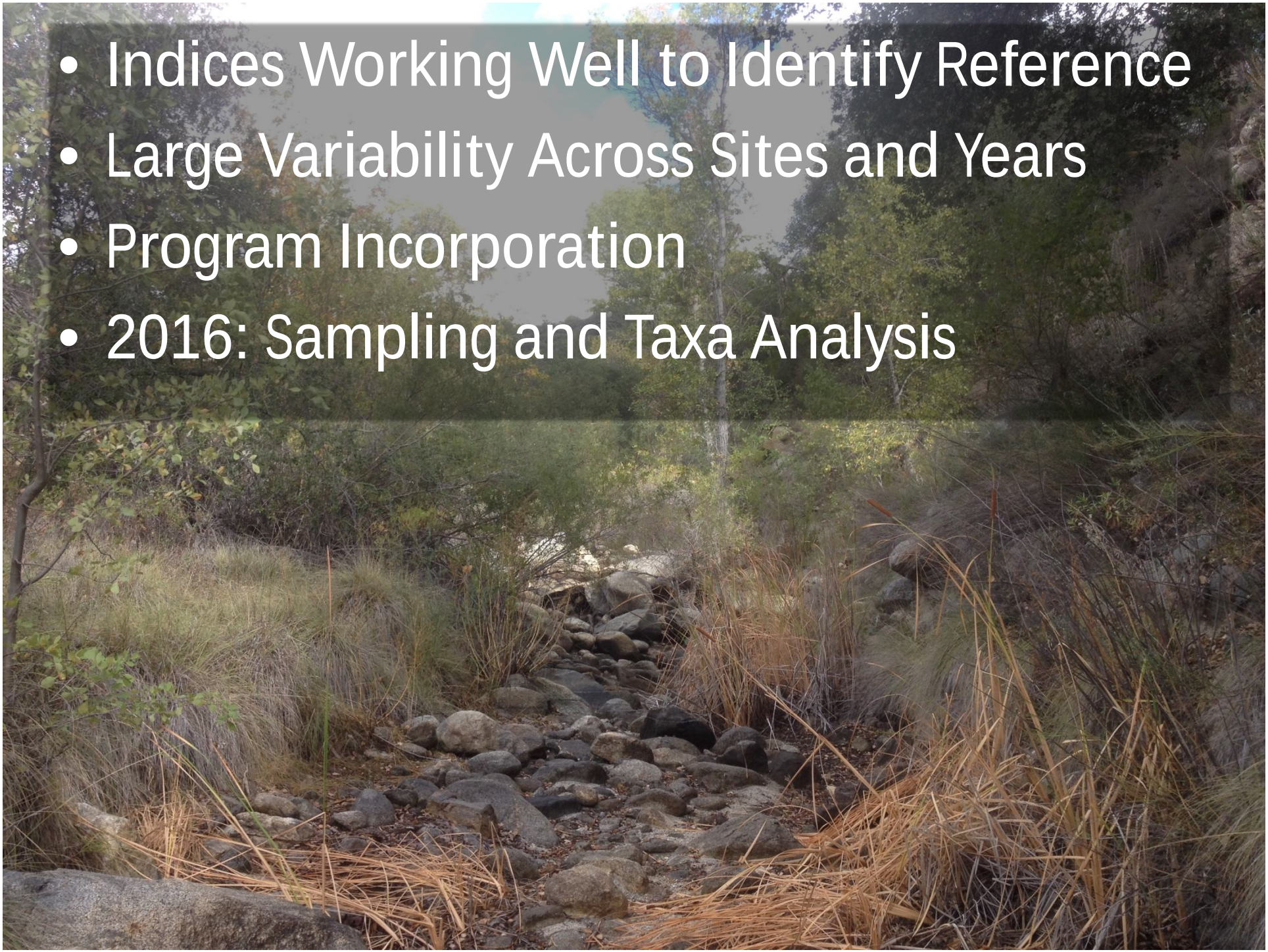
Carney Canyon

3/25/2014 CSCI: 0.80, S2: 83
25 Days of “Flow”
Stream in Drying Stage

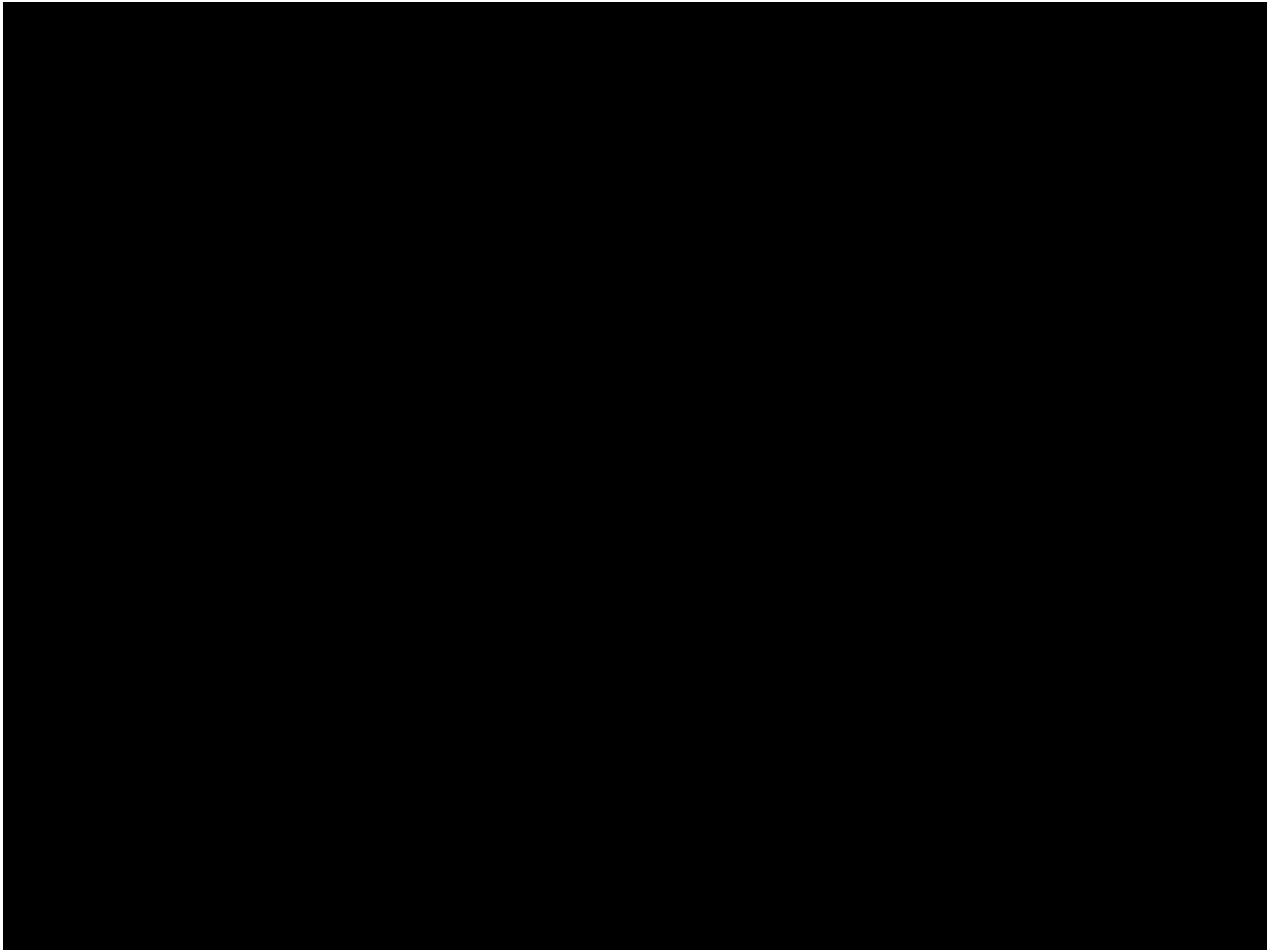
Carney Canyon

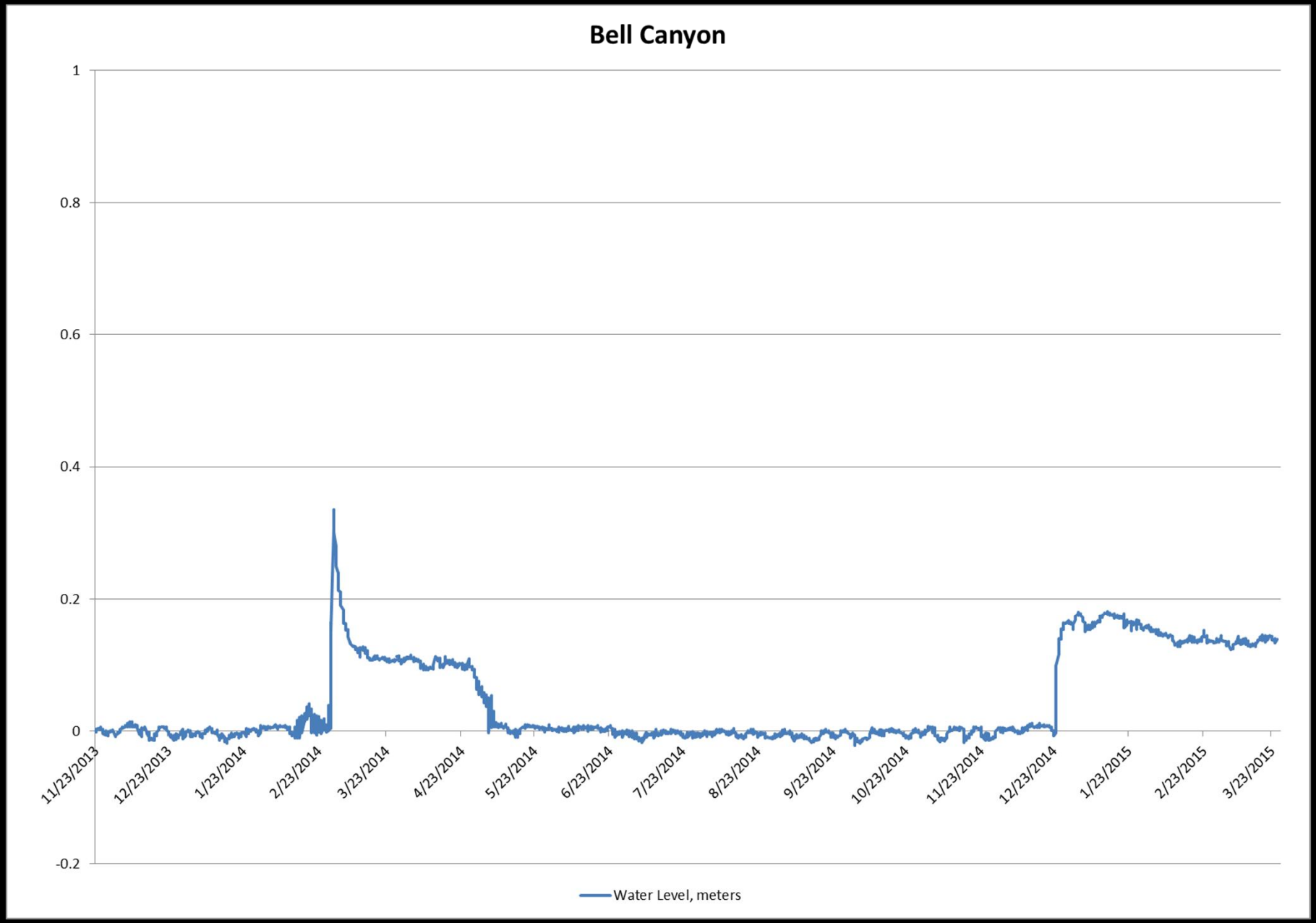
3/27/2015 DRY


Carney Canyon
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
11/27/2013
12/27/2013
1/27/2014
2/27/2014
3/27/2014
4/27/2014
5/27/2014
6/27/2014
7/27/2014
8/27/2014
9/27/2014
10/27/2014
11/27/2014
12/27/2014
1/27/2015
2/27/2015
3/27/2015
4/27/2015
5/27/2015



- Indices Working Well to Identify Reference
- Large Variability Across Sites and Years
- Program Incorporation
- 2016: Sampling and Taxa Analysis




Bell Canyon
1
0.8
0.6
0.4
0.2
0
-0.2
11/23/2013
12/23/2013
1/23/2014
2/23/2014
3/23/2014
4/23/2014
5/23/2014
6/23/2014
7/23/2014
8/23/2014
9/23/2014
10/23/2014
11/23/2014
12/23/2014
1/23/2015
2/23/2015
3/23/2015
Water Level, meters

Descanso Creek

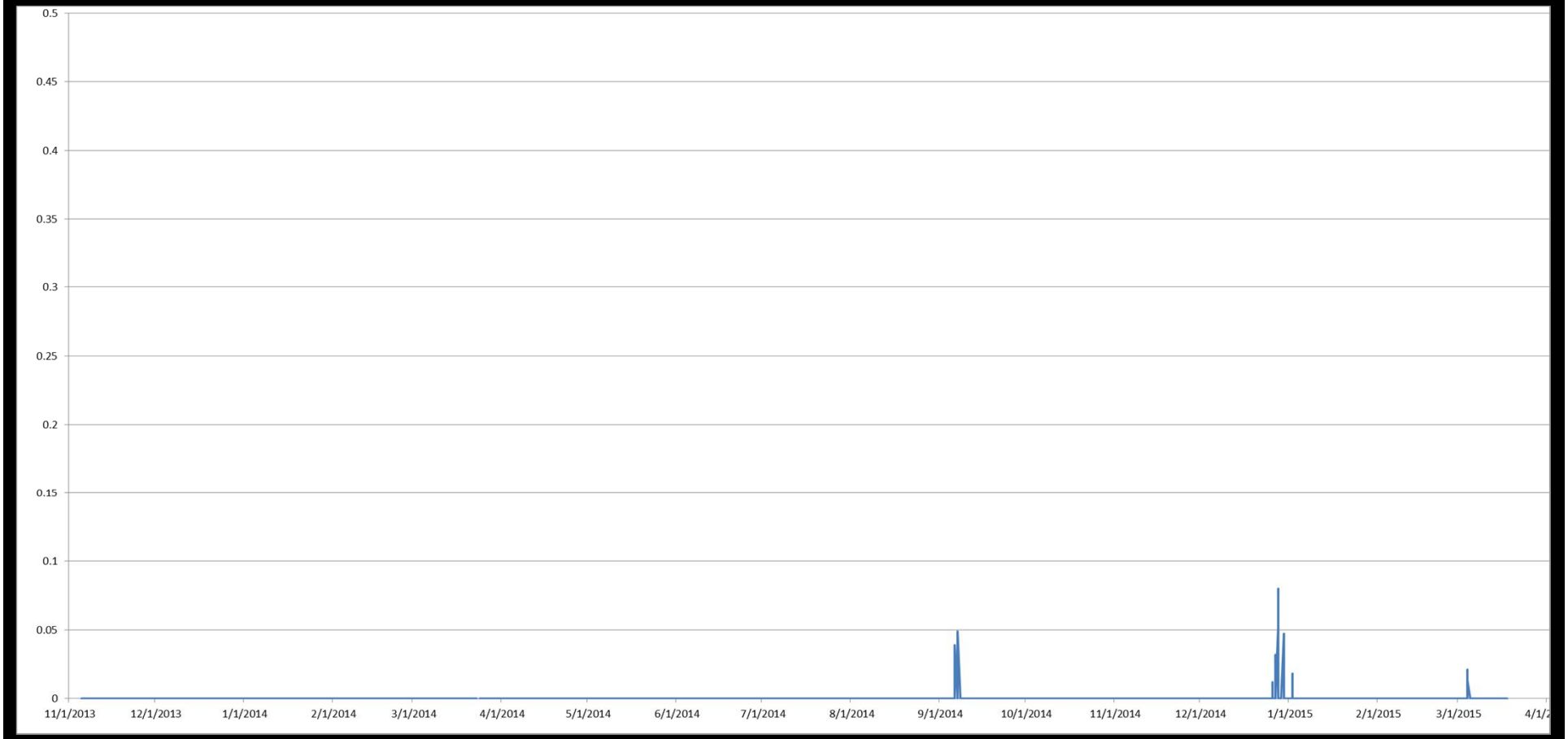
Photo: 4/25/2013

Last Rainfall: 03/08/2013

Dry: 07/09/2013

Ideal Site?

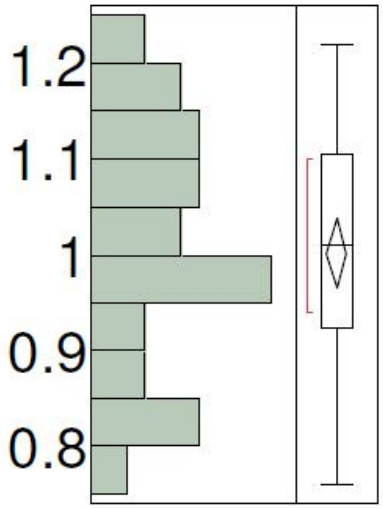
Descanso Creek



Predictions are hard

Distributions

CSCI Score



Quantiles

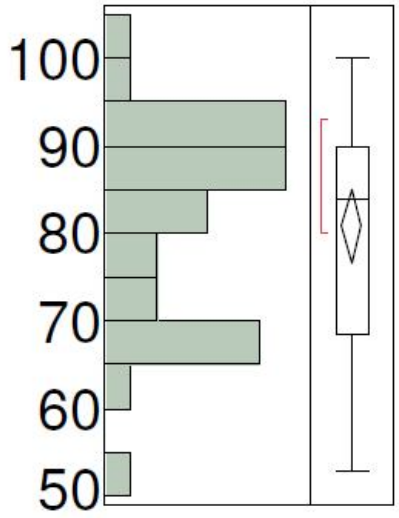
100.0%	maximum	1.22
99.5%		1.22
97.5%		1.215
90.0%		1.19
75.0%	quartile	1.105
50.0%	median	1.01
25.0%	quartile	0.925
10.0%		0.82
2.5%		0.765
0.5%		0.76
0.0%	minimum	0.76

Summary Statistics

Mean	1.0012245
Std Dev	0.1274041
Std Err Mean	0.0182006
Upper 95% Mean	1.0378192
Lower 95% Mean	0.9646298
N	49

Distributions

Algae S2 Score



Quantiles

100.0%	maximum	100
99.5%		100
97.5%		100
90.0%		93
75.0%	quartile	90
50.0%	median	84
25.0%	quartile	68.5
10.0%		67
2.5%		53
0.5%		53
0.0%	minimum	53

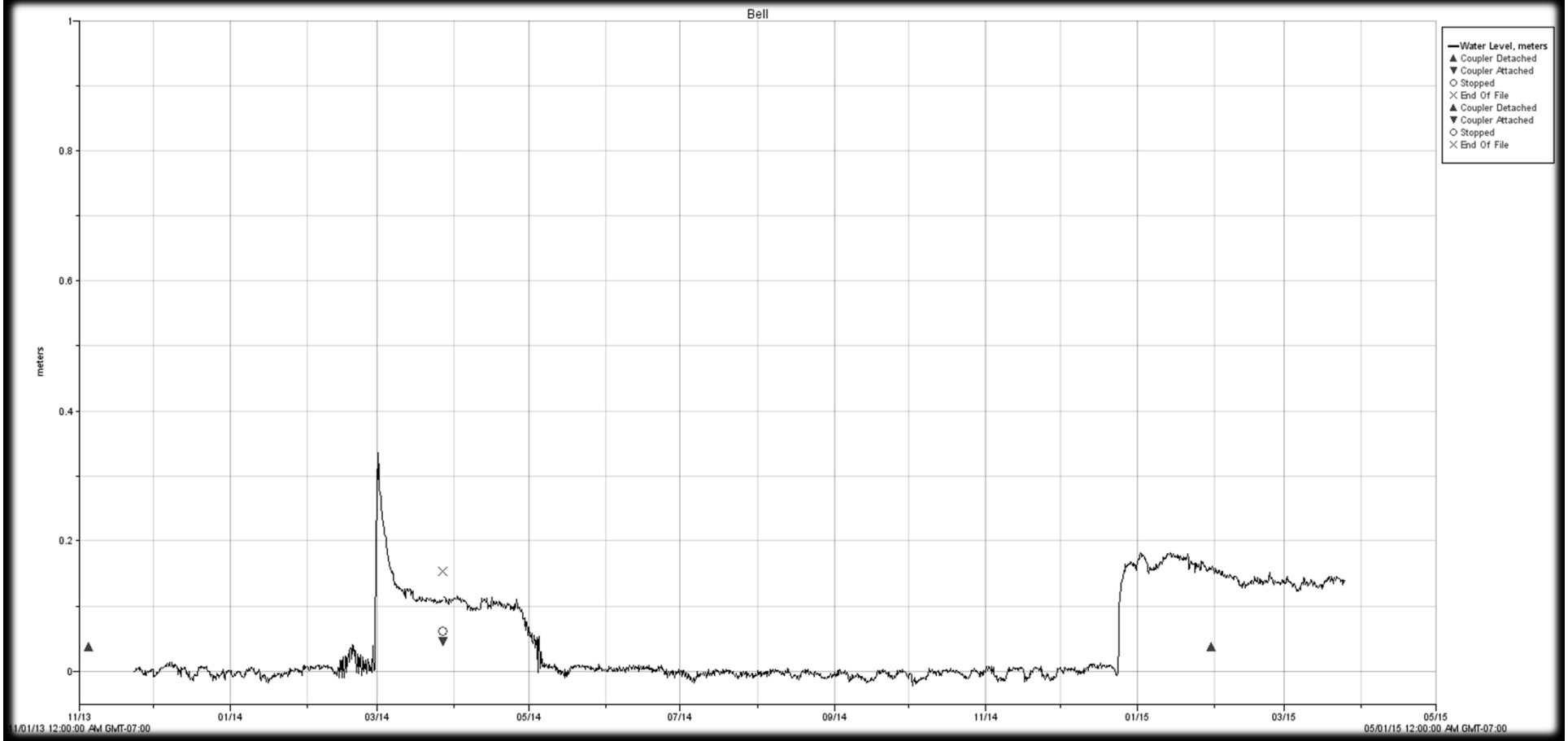
Summary Statistics

Mean	80.8125
Std Dev	11.509989
Std Err Mean	2.0346978
Upper 95% Mean	84.962293
Lower 95% Mean	76.662707
N	32

Study Expansion

- SMC Now Using Loggers
- PSA Using Loggers and Testing New Technologies
- Other Regional Boards
  - Region 2
  - Region 7
  - Region 8

Sites



2014: 2.5 Months of Flow
2015: 4+ Months